

We claim:

1. A solid choline ascorbate formulation with reduced sensitivity to external stress factors.
2. A formulation as claimed in claim 1, wherein a solution of this formulation has under standard conditions
  - i) a Gardner color number (determined as specified in DIN-ISO 4630 or ASTM D 1544-80) of  $< 4.5$ , and/or
  - ii) a Hazen color number (determined as specified in DIN-ISO 6271 or ASTM D 1045-68, ASTM D 263-49 or ASTM D 1209-69) of  $< 800$ .
3. A formulation as claimed in claim 1 or 2, which does not deliquesce on storage under standard conditions in moist ambient air.
4. A formulation as claimed in any of claims 1 to 3, wherein
  - a) choline ascorbate is surface-coated with an inert coating composition;
  - b) choline ascorbate is embedded in an inert matrix; or
  - c) a porous carrier is loaded with choline ascorbate, and the loaded carrier is surface-coated where appropriate with an inert coating composition.
5. A formulation as claimed in any of the preceding claims, which additionally comprises an effective amount of at least one addition which further reduces the tendency to discoloration of choline ascorbate.
6. A formulation as claimed in claim 5, wherein the addition which further reduces the tendency to discoloration of choline ascorbate is mixed with the choline ascorbate and/or is present in the surface coating, in the inert matrix or in the porous carrier.
7. A formulation as claimed in claim 5 or 6, wherein the stabilizer is present in a proportion of about 0.05 to 30 mol% based on the molar content of choline ascorbate.
8. A formulation as claimed in any of claims 5 to 7, wherein the stabilizer is selected from sulfur-containing, phosphorus-containing or boron-containing compounds; carboxylic acids and carboxylic acid derivatives; vitamins and vitamin precursors and

derivatives; natural product mixtures; hydroxy- or alkoxyaromatic compounds; reductones or mixtures thereof.

9. A formulation as claimed in claim 8, wherein

- 5 a) the sulfur-containing stabilizer is selected from cysteine, cystine, N-acetylcysteine, thioglycolate, glutathione, dihydrolipoic acid, lipoic acid, sodium dithionite, methionine and thiourea;
- b) the phosphorus-containing stabilizer is selected from phosphorous and hypophosphorous acid;
- 10 c) the boron-containing stabilizer is phenylboronic acid;
- d) the carboxylic acids and carboxylic acid derivatives are selected from uric, lactic, malic, citric and excess ascorbic acid; and ascorbyl palmitate;
- e) the vitamins, vitamin precursors and derivatives are selected from alpha-, beta- and gamma-tocopherol, tocotrienol and more water-soluble vitamin E
- 15 derivatives; carotenoids; isoflavones; flavonoids and other naturally occurring polyphenols;
- f) the natural product mixture is a rosemary extract;
- g) the reductone is hydroxyacetone; and
- h) the hydroxy- or alkoxy-aromatic compounds are selected from 6-ethoxy-1,2-
- 20 dihydro-2,2,4-trimethylquinoline (ethoxyquin), t-butylhydroxytoluene and t-butylhydroxyanisole;

or the stabilizer is a functional derivative, having a stabilizing action, of one of the above compounds.

25 10. A formulation as claimed in any of the preceding claims, wherein the choline ascorbate content is in a range from about 5 to 95% by weight based on the total weight of the formulation.

30 11. A formulation as claimed in any of the preceding claims, which is coated with a coating composition comprising at least one compound selected from:

- a) polyalkylene glycols;
- b) polyalkylene oxide polymers or copolymers;
- c) substituted polystyrenes, maleic acid derivatives and styrene/maleic acid copolymers;
- 35 d) vinyl polymers either alone or in combination with other compounds, such as cellulose ethers or starches;

- e) vinylpyrrolidone/vinyl acetate copolymers;
- f) polyvinyl alcohols, and polyphthalic acid vinyl esters;
- g) hydroxypropylmethylcelluloses;
- h) alkyl (meth)acrylate polymers and copolymers;
- 5 i) polyvinyl acetates, where appropriate stabilized with polyvinylpyrrolidone;
- j) polyalkylenes;
- k) aromatic polymers;
- l) polyacrylic acids;
- m) polyacrylamides;
- 10 n) polycyanoacrylates;
- o) phenoxyacetic acid/formaldehyde resins;
- p) cellulose derivatives;
- q) animal, vegetable or synthetic fats and modified fats;
- r) animal and vegetable waxes or chemically modified animal and vegetable
- 15 waxes;
- s) animal and vegetable proteins;
- t) mono- and disaccharides, oligosaccharides, polysaccharides;
- u) vegetable oils, synthetic or semisynthetic oils and animal oils;
- v) hardened (hydrogenated or partially hydrogenated) oils/fats;
- 20 w) lacquer coatings;
- x) fatty acids;
- y) silicas;

or mixtures thereof.

- 25 12. A formulation as claimed in any of claims 1 to 10, wherein the choline ascorbate is embedded in a matrix which comprises at least one compound as defined in claim 11 which is suitable for forming a matrix which is solid at a temperature in the range from about 20 to 100°C.
- 30 13. A formulation as claimed in any of claims 1 to 10, which comprises a porous carrier selected from silicates.
- 35 14. A process for preparing a choline ascorbate-containing formulation as claimed in any of the preceding claims, which comprises solid choline ascorbate particles being coated by being

- a) sprayed in a fluidized bed with a melt, a solution or a dispersion of a coating composition as defined in claim 11, or subjected to a powder coating with the coating composition in a fluidized bed; or
- b) coated in a mixer with a melt, a solution or a dispersion of the coating composition, or subjected to a powder coating with the coating composition; or
- c) mixed with fat, and the fat being melted by mechanical energy input and/or heating, while mixing is continued;

and the coated material obtained in each case where appropriate being dried, cooled and/or freed of coarse fractions.

15. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises solid choline ascorbate particles being suspended in a melt comprising a (fusible) coating composition as defined in claim 11, and the suspension obtained in this way being dispersed and subsequently solidified.
16. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises solid choline ascorbate particles being dispersed in a lipophilic environment, the solid/oil droplets obtained in this way being emulsified in an aqueous phase, and the emulsion being spray-formulated.
17. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises choline ascorbate particles being coated by coacervation.
18. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises an aqueous protective colloid solution being prepared, choline ascorbate being dissolved or dispersed therein, and the resulting mixture subsequently being spray-formulated or spray-dried and subsequently coated where appropriate.
19. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises an aqueous choline ascorbate-containing solution being spray-dried in a fluidized bed and being granulated or agglomerated by addition of suitable additives.

20. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises a solution, emulsion or suspension comprising choline ascorbate being mixed with a porous carrier and dried where appropriate; or a melt comprising choline ascorbate being applied to the porous carrier.

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21. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises wet granules comprising a choline ascorbate-containing solution or dispersion or a choline ascorbate-containing melt and a carrier, or comprising solid, crystalline or amorphous choline ascorbate, being prepared, the wet granules being extruded, where appropriate after-treated, dried and subsequently coated where appropriate.

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22. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises an aqueous solution of choline ascorbate being prepared, the latter being emulsified in a hydrophobic melt, and the emulsion being solidified.

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23. A process for preparing a choline ascorbate-containing formulation as claimed in any of claims 1 to 10, which comprises a melt comprising choline ascorbate being atomized where appropriate in the presence of a dusting agent in a stream of cold gas.

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24. A human or animal food which, besides conventional ingredients of human or animal foods, comprises a choline ascorbate-containing formulation as defined in any of claims 1 to 13 in a proportion of about 0.001 to 50% by weight.

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25. A human or animal food supplement which, besides conventional ingredients of human or animal food supplements, comprises a choline ascorbate-containing formulation as defined in any of claims 1 to 13 in a proportion of about 0.01 to 99.9% by weight.

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26. A pharmaceutical in solid, liquid or pasty form, which comprises in a pharmaceutically suitable carrier an effective amount of a choline ascorbate-containing formulation as claimed in any of claims 1 to 13.

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ART 34 AMDT

27. The use of a choline ascorbate-containing formulation as claimed in any of claims 1 to 13 for preparing human and animal foods, and human and animal food supplements, or pharmaceuticals.

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